

# PATENT ABSTRACTS OF JAPAN

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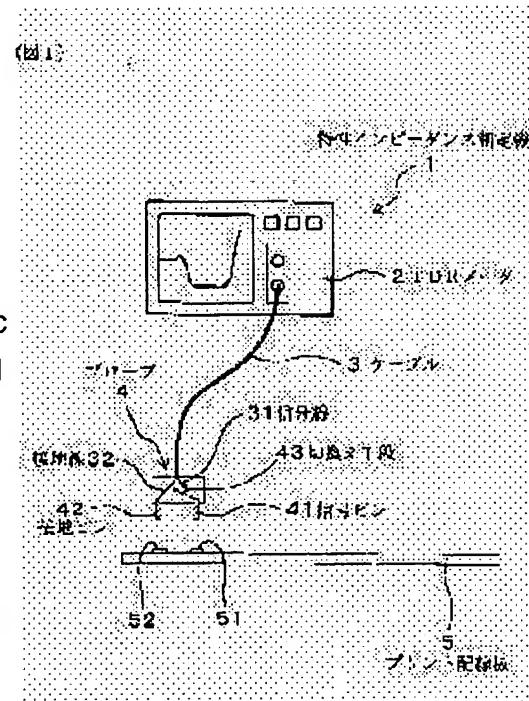
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## (54) MEASURING INSTRUMENT FOR CHARACTERISTIC IMPEDANCE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a characteristic impedance measuring instrument which can efficiently take a measurement, while surely performing electrostatic discharging.

SOLUTION: This characteristic impedance measuring instrument 1 has a TDR meter 2, which sends an electric signal to a printed wiring board 5 and receives the signal to measures characteristic impedance and also displays the measurement result and a probe 4, which is electrically connected to the TDR meter 2 via a cable 3. The probe 4 has signal pins 41, which are made to abut against signal measurement pad 51 of the printed wiring board 5 and a ground pin 42, which is made to abut against a grounding measurement pad 52. The ground pin 42 is connected to a ground line 32 of a cable 3. The signal pin 41 has a switching means 43 for switching between connections with the signal line 31 and a ground line 32 of the cable 3.



## LEGAL STATUS

[Date of request for examination]

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**PRIOR ART**

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[Description of the Prior Art] Conventionally, in order to measure the characteristic impedance of a printed wired board, the characteristic-impedance measurement machine 9 as shown in drawing 5 is used. This characteristic-impedance measurement machine 9 has the TDR meter 92 and the probe 94 electrically connected to this TDR meter 92.

[0003] The above-mentioned TDR meter 92 displays a measurement result while sending an electrical signal to a printed wired board 5, receiving and measuring a characteristic impedance. Moreover, the above-mentioned probe 94 has the signal pin 941 and the ground pin 942. Moreover, the above-mentioned probe 94 is connected to the above-mentioned TDR meter 92 by the cable 93.

[0004] In measuring the characteristic impedance of the above-mentioned printed wired board 5 with the above-mentioned characteristic-impedance measurement machine 9, the measurement pad 51 for signals and the measurement pad 52 for touch-down which prepared the signal pin 941 and ground pin 942 of the above-mentioned probe 94 in the above-mentioned printed wired board 5 are made to contact, and the above-mentioned electrical signal is made to deliver and receive between the above-mentioned printed wired board 5 and the above-mentioned TDR meter 92.

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[Translation done.]

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved] However, there are the following problems in the above-mentioned conventional characteristic-impedance measurement machine 9. That is, static electricity may be charged in the above-mentioned measurement pad 51 for signals. If it is going to measure by contacting the signal pin 941 of the above-mentioned characteristic-impedance measurement machine 9 to the above-mentioned measurement pad 51 for signals where the measurement pad 51 for signals is charged, electrified static electricity will flow into the above-mentioned TDR meter 92 through the signal pin 941.

[0006] On the other hand, since the above-mentioned TDR meter 92 has low withstand voltage nature, it has a possibility of producing fault by the influx of above-mentioned static electricity. Then, it is necessary using an electric conduction brush etc. to perform \*\*\* of the above-mentioned measurement pad 51 for signals for every measurement. Therefore, there is a problem that measurement effectiveness cannot necessarily say low that \*\*\* can be performed certainly.

[0007] This invention was made in view of this conventional trouble, and it tends to offer the characteristic-impedance measurement machine which can be measured efficiently, performing \*\*\* certainly.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the characteristic-impedance measurement machine for measuring the characteristic impedance of a printed wired board.

[0002]

[Description of the Prior Art] Conventionally, in order to measure the characteristic impedance of a printed wired board, the characteristic-impedance measurement machine 9 as shown in drawing 5 is used. This characteristic-impedance measurement machine 9 has the TDR meter 92 and the probe 94 electrically connected to this TDR meter 92.

[0003] The above-mentioned TDR meter 92 displays a measurement result while sending an electrical signal to a printed wired board 5, receiving and measuring a characteristic impedance. Moreover, the above-mentioned probe 94 has the signal pin 941 and the ground pin 942. Moreover, the above-mentioned probe 94 is connected to the above-mentioned TDR meter 92 by the cable 93.

[0004] In measuring the characteristic impedance of the above-mentioned printed wired board 5 with the above-mentioned characteristic-impedance measurement machine 9, the measurement pad 51 for signals and the measurement pad 52 for touch-down which prepared the signal pin 941 and ground pin 942 of the above-mentioned probe 94 in the above-mentioned printed wired board 5 are made to contact, and the above-mentioned electrical signal is made to deliver and receive between the above-mentioned printed wired board 5 and the above-mentioned TDR meter 92.

[0005]

[Problem(s) to be Solved] However, there are the following problems in the above-mentioned conventional characteristic-impedance measurement machine 9. That is, static electricity may be charged in the above-mentioned measurement pad 51 for signals. If it is going to measure by contacting the signal pin 941 of the above-mentioned characteristic-impedance measurement machine 9 to the above-mentioned measurement pad 51 for signals where the measurement pad 51 for signals is charged, electrified static electricity will flow into the above-mentioned TDR meter 92 through the signal pin 941.

[0006] On the other hand, since the above-mentioned TDR meter 92 has low withstand voltage nature, it has a possibility of producing fault by the influx of above-mentioned static electricity. Then, it is necessary using an electric conduction brush etc. to perform \*\*\*\* of the above-mentioned measurement pad 51 for signals for every measurement. Therefore, there is a problem that measurement effectiveness cannot necessarily say low that \*\*\*\* can be performed certainly.

[0007] This invention was made in view of this conventional trouble, and it tends to offer the characteristic-impedance measurement machine which can be measured efficiently, performing \*\*\*\* certainly.

[0008]

[Means for Solving the Problem] The TDR meter which displays a measurement result while invention according to claim 1 sends an electrical signal to a printed wired board, receiving and measuring a

characteristic impedance. In the characteristic-impedance measurement machine which has the probe electrically connected to this TDR meter through the cable the above-mentioned probe The signal pin made to contact the measurement pad for signals electrically connected with the signal plane in the above-mentioned printed wired board, It has the ground pin made to contact the measurement pad for touch-down electrically connected with the ground layer in the above-mentioned printed wired board. This ground pin It connects with the grounding conductor of the above-mentioned cable connected with the earth terminal of the above-mentioned TDR meter. And the above-mentioned signal pin It is in the characteristic-impedance measurement machine characterized by having the change means which switches connection with the signal line of the above-mentioned cable connected with the signal terminal of the above-mentioned TDR meter, and connection with the above-mentioned grounding conductor.

[0009] What should be most observed in this invention is having a change means the above-mentioned signal pin's switching connection between connection with the above-mentioned signal line, and the above-mentioned grounding conductor. As this change means, a relay switch can be used, for example.

[0010] Next, it explains per operation effectiveness of this invention. If in charge of measuring the characteristic impedance of a printed wired board using the above-mentioned characteristic-impedance measurement machine, the signal pin in the above-mentioned probe is made to contact the measurement pad for signals of a printed wired board, and the above-mentioned ground pin is made to contact the measurement pad for touch-down of a printed wired board. The above-mentioned signal pin is connected to the above-mentioned grounding conductor at this time. Thereby, static electricity charged in the measurement pad for signals is \*\*\*\*(ed) through a signal pin and a grounding conductor.

[0011] And an electrical signal is delivered [ the above-mentioned signal pin is connected to the above-mentioned signal line with the above-mentioned change means, and ] and received through the above-mentioned signal pin between the above-mentioned TDR meter and a printed wired board.

[0012] Thus, since it has the above-mentioned change means, the characteristic-impedance measurement machine of this invention can connect the above-mentioned signal pin to a grounding conductor, before measuring. Thereby, before measurement of a characteristic impedance, static electricity charged in the above-mentioned measurement pad for signals can be certainly \*\*\*\*(ed) through the above-mentioned signal pin and a grounding conductor. Moreover, in case a characteristic impedance is measured, measurement can be easily started by switching connection of the above-mentioned signal pin to the above-mentioned signal line with the above-mentioned change means. So, a characteristic impedance can be measured efficiently.

[0013] According to this invention, like the above, the characteristic-impedance measurement machine which can be measured efficiently can be offered, performing \*\*\*\* certainly.

[0014]

[Embodiment of the Invention] operation -- a gestalt -- an example -- one -- this invention -- operation -- a gestalt -- an example -- starting -- a characteristic impedance -- measurement -- a machine -- attaching -- drawing 1 - < -- A HREF -- = -- " -- /-- Tokujitu/tjitemdrw . -- ipdl?N -- 0000 -- = -- 237 -- & -- N -- 0500 -- = -- one -- E\_N -- /--; -- > --; -- > --; -- seven -- = -- six -- > -- /-- /-- /-- & -- N -- 0001 -- = -- 743 -- & -- N -- 0552 -- = -- nine -- & -- N -- 0553 -- = -- 000005 -- " -- TARGET -- = -- "tjitemdrw" -- > -- drawing 3 -- using -- explaining . The characteristic-impedance measurement machine 1 of this example has the TDR meter 2 which displays a measurement result while sending an electrical signal to a printed wired board 5, receiving and measuring a characteristic impedance, as shown in drawing 1 , and the probe 4 electrically connected to this TDR meter 2 through the cable 3.

[0015] The above-mentioned probe 2 has the signal pin 41 made to contact the measurement pad 51 for signals electrically connected with the signal plane 53 in the above-mentioned printed wired board 5, and the ground pin 42 made to contact the measurement pad 52 for touch-down electrically connected with the ground layer 54 in the above-mentioned printed wired board 5, as shown in drawing 2 .

[0016] The above-mentioned cable 3 has the grounding conductor 32 connected with the earth terminal of the above-mentioned TDR meter 2, and the signal line 31 connected with the signal terminal of the above-mentioned TDR meter 2. The above-mentioned ground pin 42 is connected to the grounding

conductor 32 of the above-mentioned cable 3. On the other hand, the above-mentioned signal pin 41 has the change means 43 which switches connection with the signal line 31 of the above-mentioned cable 3, and connection with the above-mentioned grounding conductor 32, as shown in drawing 2 and drawing 3. The relay switch is used as this change means 43.

[0017] Next, it explains per operation effectiveness of this example. If in charge of measuring the characteristic impedance of a printed wired board 5 using the above-mentioned characteristic-impedance measurement machine 1, the signal pin 41 in the above-mentioned probe 4 is made to contact the measurement pad 51 for signals of a printed wired board 5, and the above-mentioned ground pin 42 is made to contact the measurement pad 52 for touch-down of a printed wired board 5. At this time, as shown in drawing 3 (B), the above-mentioned signal pin 41 is connected to the above-mentioned grounding conductor 32. Thereby, static electricity charged in the measurement pad 51 for signals is \*\*\*\*(ed) through the signal pin 41 and a grounding conductor 32.

[0018] And an electrical signal is delivered [ as shown in drawing 3 (A) / the above-mentioned change means 43 connects the signal pin 41 to the above-mentioned signal line 31, and ] and received through the signal pin 41 between the above-mentioned TDR meter 2 and a printed wired board 5. As shown in drawing 3 (B), with the above-mentioned change means 43, after measurement of the above-mentioned characteristic impedance cancels connection between the above-mentioned signal pin 41 and a signal line 31, and connects the above-mentioned signal pin 41 to the above-mentioned grounding conductor 32. It changes into the condition that static electricity charged by this in the measurement pad 51 for signals which measures next can be \*\*\*\*(ed) through the above-mentioned signal pin 41 and the above-mentioned grounding conductor 32.

[0019] Thus, since it has the above-mentioned change means 43, the characteristic-impedance measurement machine 1 of this example can connect the above-mentioned signal pin 41 to a grounding conductor 32, before measuring. Thereby, before measurement of a characteristic impedance, static electricity charged in the above-mentioned measurement pad 51 for signals can be certainly \*\*\*\*(ed) through the above-mentioned signal pin 41 and a grounding conductor 32. Moreover, in case a characteristic impedance is measured, measurement can be easily started by switching connection of the above-mentioned signal pin 41 to the above-mentioned signal line 31 with the above-mentioned change means 43. So, a characteristic impedance can be measured efficiently.

[0020] The example of two examples of an operation gestalt is an example of the characteristic-impedance measurement machine which formed the signal pin 41 and the ground pin 42 possible [ telescopic motion ] to the body 44 of a probe 40, as shown in drawing 4. The above-mentioned signal pin 41 and a ground pin 42 are in the condition of having elongated as shown in drawing 4 (A) before measurement. At this time, the above-mentioned signal pin 41 will be in the condition of having connected with the grounding conductor 32.

[0021] Moreover, the above-mentioned signal pin 41 and a ground pin 42 will be in the condition of having degenerated, by being pushed in contact with the measurement pad 51 for signals of a printed wired board 5, and the measurement pad 52 for touch-down at the time of measurement, as shown in drawing 4 (B). Thereby, the above-mentioned signal pin 41 is connected with a signal line 31 while connection with a grounding conductor 32 is canceled. Others are the same as that of the example 1 of an operation gestalt.

[0022] Thereby, the above-mentioned signal pin 41 can \*\*\*\* static electricity charged in this measurement pad 51 for signals through the above-mentioned signal pin 41 and a grounding conductor 32 by contacting the above-mentioned measurement pad 51 for signals in the state of expanding (drawing 4 (A)). Subsequently, if a probe 40 is pressed against a printed wired board 5, the above-mentioned signal pin 41 will be in the condition that a characteristic impedance can be measured, by degenerating and connecting with the above-mentioned signal line 31 (drawing 4 (B)).

[0023] Thus, since the flexible device of the above-mentioned signal pin 41 constitutes the change means 43 as it is, the cheap probe 40 can be obtained with easy structure. In addition, it has the same operation effectiveness as the example 1 of an operation gestalt.

[0024]

[Effect of the Invention] According to this invention, like \*\*\*\*, the characteristic-impedance measurement machine which can be measured efficiently can be offered, performing \*\*\*\* certainly.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The explanatory view of the characteristic-impedance measurement machine in the example 1 of an operation gestalt.

[Drawing 2] The cross-section explanatory view of a probe and a printed wired board in the example 1 of an operation gestalt.

[Drawing 3] The explanatory view of the probe at the time of (A) measurement in the example 1 of an operation gestalt, the explanatory view of the probe before (B) measurement.

[Drawing 4] The explanatory view of the probe before (A) measurement in the example 2 of an operation gestalt, the explanatory view of the probe at the time of (B) measurement.

[Drawing 5] The explanatory view of the characteristic-impedance measurement machine in the conventional example.

[Description of Notations]

1 ... a characteristic-impedance measurement machine,

2 ... TDR meter,

3 ... a cable,

31 ... a signal line,

32 ... a grounding conductor,

4 40 ... Probe,

41 ... a signal pin,

42 ... a ground pin,

43 ... a change means,

5 ... a printed wired board,

51 ... the measurement pad for signals,

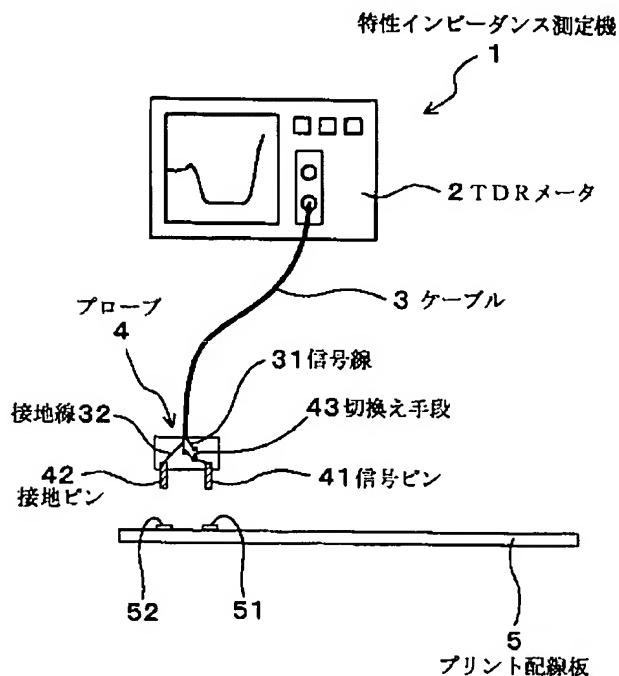
52 ... the measurement pad for touch-down,

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[Translation done.]

Drawing selection Representative drawing

(図1)



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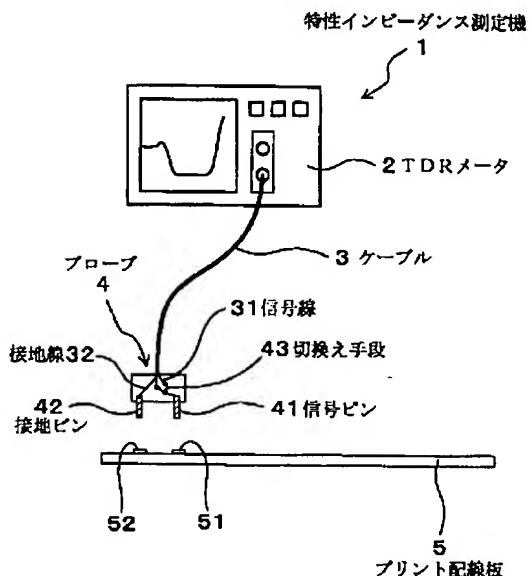
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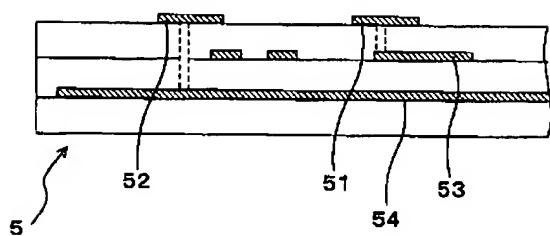
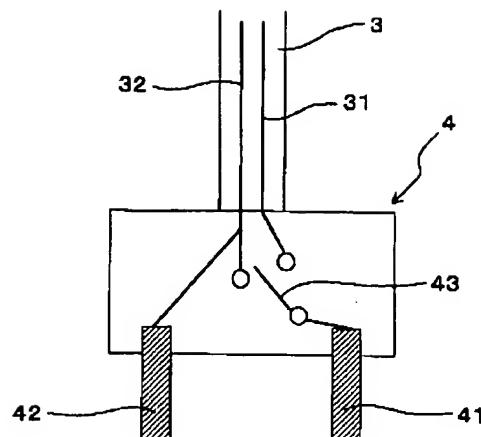
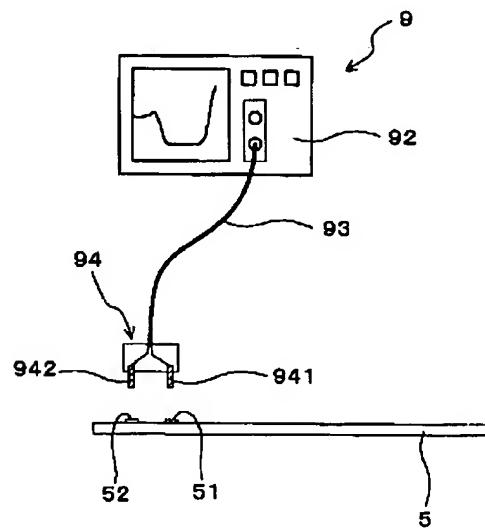
## DRAWINGS

[Drawing 1]  
(図1)



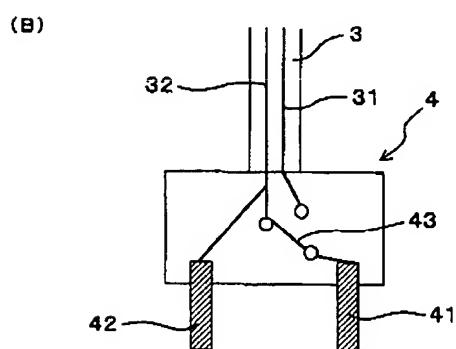
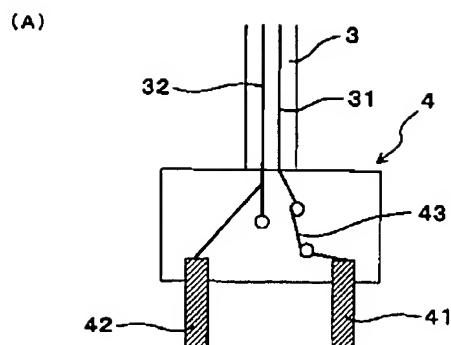
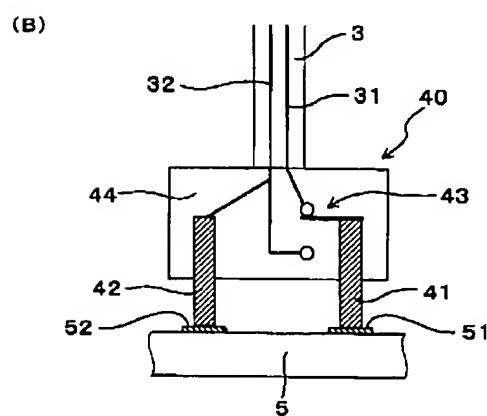
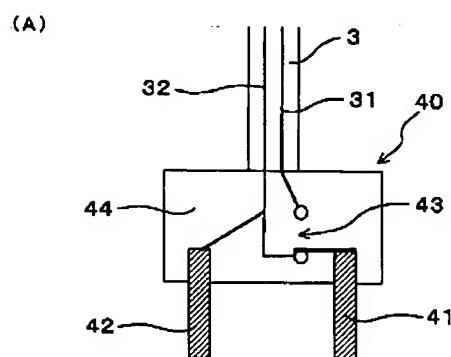
[Drawing 2]

(図 2)

[Drawing 5]  
(図 5)

[Drawing 3]

(図3)

[Drawing 4]  
(図4)

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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]** The TDR meter which displays a measurement result while sending an electrical signal to a printed wired board, receiving and measuring a characteristic impedance, In the characteristic-impedance measurement machine which has the probe electrically connected to this TDR meter through the cable the above-mentioned probe The signal pin made to contact the measurement pad for signals electrically connected with the signal plane in the above-mentioned printed wired board, It has the ground pin made to contact the measurement pad for touch-down electrically connected with the ground layer in the above-mentioned printed wired board. This ground pin It connects with the grounding conductor of the above-mentioned cable connected with the earth terminal of the above-mentioned TDR meter. And the above-mentioned signal pin The characteristic-impedance measurement machine characterized by having the change means which switches connection with the signal line of the above-mentioned cable connected with the signal terminal of the above-mentioned TDR meter, and connection with the above-mentioned grounding conductor.

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**[Translation done.]**